Gas cooler series TC-Double+

In emission measurement, process control relies on prompt and exact determination of the operating parameters.

Here, gas analysis is the key for safe and efficient control of process flows, environmental protection and quality assurance. This benefits controlling flue gas emission in power stations as well as measurements in small combustion plants or exhaust gas analysis in automotive engineering.

Many of the analysis processes used in these fields require extracting the sample gas. This inevitably also extracts process-related contamination such as particles or moisture. These in turn can impact the measurement results or damage the measuring cells. The sample gas must therefore be conditioned before entering the analyser.

The TC-Double+ series features a new generation heat exchangers with a particularly low wash out effect of water-soluble components and are specifically suitable for measuring emissions. Particularly the wash out effect of SO_2 is low. These coolers can therefore be used for so-called automated measuring systems (AMS) per EN 15267-3.

- CE mark standard
- FM approval optional
- Low wash out effects
- One gas path
- Duran glass or PVDF heat exchanger
- Rated power 270/310 kJ/h, 40 °C/60 °C version
- Max. ambient temperature 60 °C
- Dew point stability 0.1 °C
- Status display and output
- Moisture detector connection, analog output, filter, and peristaltic pump optional

Bühler Technologies GmbH, Harkortstr. 29, D-40880 Ratingen
Tel. +49 (0) 21 02 / 49 89-0, Fax: +49 (0) 21 02 / 49 89-20
E-Mail: analyse@buehler-technologies.com
Internet: www.buehler-technologies.com

Overview

TC-Double+ coolers were designed specifically for high cooling capacities, high ambient temperatures and to cool in two cycles to minimise wash out effects. The two cooling blocks can be set do different temperatures.

Any other use of this cooler is determined by the type of built-in passive pre-cooling, i.e. the first cooling level is not controlled electronically.

The Peltier coolers are distinguished according to cooling capacity/operating temperature. This classification is reflected in the type designation. The exact item number of the model defined by you is determined by the model code in the category ordering information.

Application	Standard applications	
Operating temperature	40 °C	50 °C
2 heat exchangers in series	TC-Double+ 6111	TC-Double+ 6112

Additional components which every conditioning system should feature can optionally be integrated:

- Peristaltic pump for condensate separation,
- Filter,
- Moisture detector,
- Sample gas pump.

This allows for various configurations of cooler and options. Here the approach is to simplify creating a complete system in a cost-efficient way through pre-installed components with hoses connected. We further paid attention to easy access to wear parts and consumables.

Description of functions

The cooler is controlled by a microprocessor. With the factory preset the control already incorporates the various characteristics of the built-in heat exchangers.

The programmable display shows the block temperatures in the selected display unit (°C / °F) (factory preset °C). Application-specific settings can easily be configured guided by the menu, using the 5 buttons. This applies to the outlet dew point setting on one hand and to the low and excess temperature warning thresholds on the other hand. These are set relative to the outlet dew point τ_a setting.

For the low temperature the range is τ_a -1 to - 3 K (at a minimum 1 °C cooling block temperature), for the excess temperature the range is τ_a +1 to +7 K. The factory presets for both values are 3 K.

The flashing display and the status relays indicate the conditions are below or above the configured warning range (e.g. after switching on).

The status output can e.g. be used to control the sample gas pump to allow for the gas flow to only be switched on once the permissible cooling range has been reached or shut off the pump in the event of a moisture detector alarm.

The separated condensate can be drained via the add-on peristaltic pump.

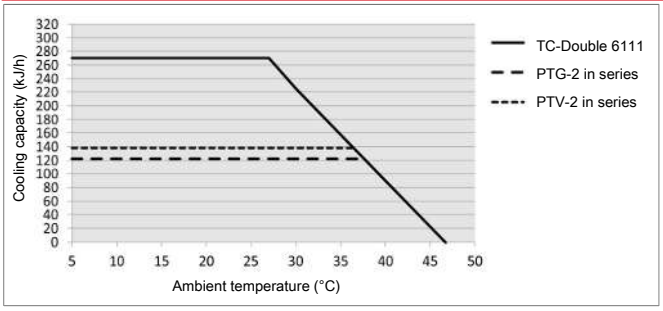
In addition, a fine filter can be attached to the cooler, which an optional moisture detector can be integrated into. The glass dome allows the dirt level of the filter element to easily be determined. The moisture detector can also be installed separately and is generally easy to remove. This may be required if water enters the cooler due to a malfunction and the peristaltic pump can no longer remove it.

A gas pump can be attached to the TC-Double+ and controlled. These are also available with bypass valve to regulate the flow rate.

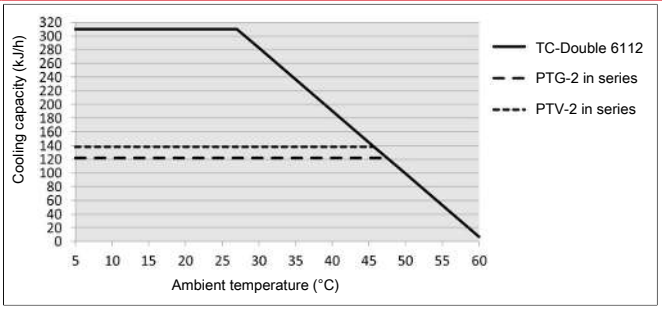
Performance curves

The TC-Double+ 6111 (X2) is designed for ambient temperatures of up to 40 °C. The cooling capacity is adequate up to this temperature. The TC-Double+ 6112 (X2) on the other hand can be used in higher temperatures up to nominal 60 °C. Please note the available cooling capacity.

Model TC-Double+ 6111 (X2)



Model TC-Double+ 6112 (X2)



Note: The limit curves for the heat exchangers exchanger apply to a dew point of 50 °C.

Heat exchanger description

The energy content of the sample gas and the required cooling capacity of the gas cooler is determined by three parameters: gas temperature ϑ_G, dew point τ_e (moisture content) and volume flow v. The outlet dew point rises with increasing energy content of the gas. The following limits for the maximum flow are specified for a standard operating point of τ_e = 50 °C and ϑ_G = 70 °C. Indicated is the maximum flow v_{max} in Nl/h of cooled air, so after moisture has condensed. Values may differ for other dew points and gas inlet temperatures. However, the physical facts are so vast we decided to omit the illustration. Please contact our experts for clarification or refer to our design program.

Heat exchanger overview

Heat exchanger	2x PTG-2	2x PTV-2 2x PTV-2-I [2]
Version / Material	Glass	PVDF
Flow rate v_{max} [1]	250 Nl/h	250 Nl/h
Inlet dew point $\tau_{e,max}$ [1]	70 °C	70 °C
Gas inlet temperature $\vartheta_{G,max}$ [1]	140 °C	140 °C
Max. Cooling capacity Q_{max}	230 kJ/h	215 kJ/h
Gas pressure p_{max}	3 bar	2 bar
Pressure drop Δp (v=150 L/h) total	20 mbar	20 mbar
Dead volume V_{tot} total	59 ml	115 ml
Gas connections (metric)	GL 14 (6 mm) [3]	DN 4/6
Gas connections (US)	GL 14 (1/4") [3]	1/4"-1/6"
Condensate out connections (metric)	GL 25 (12 mm) [3]	G3/8
Condensate out connections (US)	GL 25 (1/2") [3]	NPT 3/8"

[1] Max. cooling capacity of the cooler must be considered

[2] Models marked I have NPT threads or US tubes, respectively.

[3] Gasket inside diameter

Gas Cooler Technical Data

Gas Cooler Technical Data				
Ready for operation	after max. 10 minutes			
Ambient temperature	5 °C to 60 °C			
Gas outlet dew temperature, preset:	5 °C			
Protection class	IP 20			
Housing	Stainless steel, brushed			
Packaging dimensions	approx. 427 x 300 x 293 mm			
Weight incl. heat exchanger	approx. 11.5 kg approx. 15 kg at full expansion stage			
Electrical data	Unit without add-on		Unit with add-on (peristaltic pump + gas pump)	
	230 V AC	**115 V AC**	**230 V AC**	**115 V AC**
	1.6 A	3.2 A	2.1 A	4.1 A
	278 W / 350 VA	296 W / 370 VA	390 W / 487 VA	377 W / 472 VA
Recommended fuse (characteristic: delayed action)	2,5 A	4 A	2,5 A	5 A
Status output switching capacity	max. 250 V AC, 150 V DC 2 A, 50 VA, potential-free			
Electrical connections	Plug per EN 175301-803			
Gas connections	Heat exchange see table "Heat Exchanger Overview" Filter, moisture detector adapter, gas pump, G1/4 or NPT 1/4" or metric/US tube or pipe			
Parts in contact with mediums Filter: Moisture detector: Heat exchanger: Peristaltic pump: Tubing:	 see "Technical Data - Options" see "Technical Data - Options" see table "Heat Exchanger Overview" see "Technical Data - Options" PTFE/Viton			
FM No.	3062014			

Technical Data - Options

Analogue Output Cooler Temperature Technical Data	
Signal	4-20 mA or 2-10 V corresponds to -20 °C to +60 °C cooler temperature
Connection	M12x1 plug, DIN EN 61076-2-101

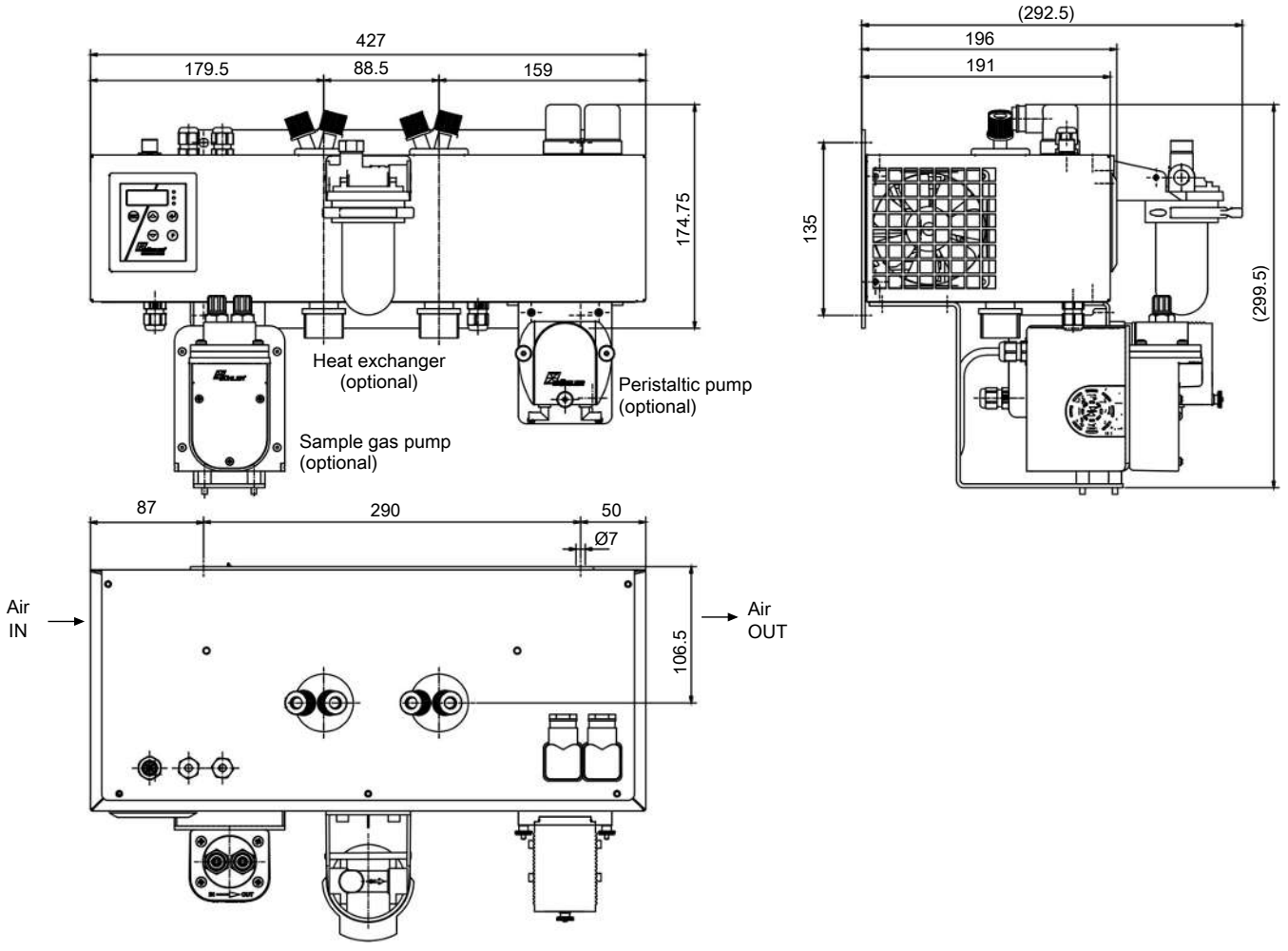
Technical Data FF-3-N Moisture Detector	
Ambient temperature	3 °C to 50 °C
max. operating pressure with FF-3-N	2 bar
Material	PVDF, PTFE, epoxy resin, stainless steel 1.4571, 1.4576

CPdouble Peristaltic Pump Technical Data	
Ambient temperature	0 °C to 55 °C
Flow rate	0.3 L/h (50 Hz) / 0.36 L/h (60 Hz) with standard hose
Vacuum inlet	max. 0.8 bar
Pressure inlet	max. 1 bar
Outlet pressure	1bar
Hose	4 x 1.6 mm
Degree of protection	IP 44
Materials Hose: Connections:	 Norprene (standard), Marprene, Fluran PVDF

Technical Data Sample Gas Pump P1	
Ambient temperature	0 °C to 50 °C
Operating pressure	max. 1,3 bar abs.
Nominal outlet	280 l/h (at p = 1 bar abs.)
Materials in contact with media vary by configuration	PTFE, PVDF, 1.4571, 1.4401, Viton, PFA

AGF-PV-30-F2 Filter Technical Data	
Ambient temperature	3 °C to 100 °C
max. operating pressure with filter	2 bar
Filter surface	60 cm^2
Filter mesh	2 µm
Dead volume	57 ml
Materials	
Filter:	PVDF, Duran glass (parts in contact with mediums)
Seal:	Viton
Filter element:	sintered PTFE

Dimensions (mm)



Ordering instructions

Gas cooler model with two heat exchangers in series

The item number is a code for the configuration of your unit. Please use the following model code:

4496	6	1	1	X	X	X	1	X	X	X	X	X	X	0	0	0	Product Characteristics
																	Gas cooler type
				1													TC-Double+ 6111: Ambient temperature 40 °C
				2													TC-Double+ 6112: Ambient temperature 60 °C
																	Certifications
					0												Standard applications - CE
					1												General purpose - FM
																	Supply voltage
						1											115 VAC, 50/60 Hz
						2											230 VAC, 50/60 Hz
																	Heat exchanger
							1	2	2								Duran glass, PTG-2, metric
							1	2	7								Duran glass, PTG-2, US fitting
							1	3	2								PVDF, PTV-2, metric
							1	3	7								PVDF, PTV-2-I, US fitting
																	Peristaltic Pumps [1]
										0							without peristaltic pump
										2							CPdouble with hose nipple, angled
										4							CPdouble with screw connection [2]
																	Sample Gas Pumps [1] [3]
											0						without sample gas pump
											1						P1, PVDF
											2						P1, with bypass valve
																	Moisture Detector/Filter [1] [2]
												0	0				without filter, without moisture detector
												0	1				without filter, 1 moisture detector with adapter
												1	0				1 filter, without moisture detector
												1	1				1 filter with built-in moisture detector
																	Status Outputs
														0	0		status output only
														1	0		Analog output option, add-on

[1] If option is selected, the maximum ambient temperature is limited to 50 ° C.

[2] Metric or US fitting, per heat exchanger.

[3] Factory installed tubing for suction operation.

Consumables and accessories

Item no.	Description
45 10 008	Automatic condensate drain AK 5.2
45 10 028	Automatic condensate drain AK 5.5
44 10 004	Automatic condensate drain AK 20
44 10 001	Automatic condensate drain 11 LD V 38
41 03 00 50	Replacement filter element F2; Unit 5 count
91 44 05 00 38	Cable for cooler temperature analog output 4 m
44 10 005	Condensate Trap GL1, 0.4 L
44 92 00 35 012	Norprene replacement hose with angled connections for peristaltic pump 0.3 L/h
44 92 00 35 014	Norprene replacement hose with one angled connection and one screw connection (metric) for peristaltic pump 0.3 L/h
44 92 00 35 015	Norprene replacement hose with one angled connection and one screw connection (US) for peristaltic pump 0.3 L/h
42 28 00 3	Bellow for P1 pump
90 09 39 8	O-ring for bypass P1 pump
42 28 06 6	Set inlet/outlet valves 70 °C for P1 pump

Axis Solutions Pvt Ltd is the Authorized Distributor of Bühler Technologies GmbH in India
www.axisindia.in | info@axisindia.in